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Indian Standard

PERMISSIBLE LIMITS OF VISUAL DEFECTS FOR INSULATING PORCELAINS FOR ELECTRICAL CIRCUITS

UDC 621·315·612·2·004·64 [621·753·2] : 621·3·049

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NEW DELHI 110002

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Electrical Insulators and Accessories Sectional Committee, ET 6

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards after the draft finalized by the Electrical Insulators and Accessories Sectional Committee had been approved by the Electrotechnical Division Council.

This standard is based on JIS G-3802 : 1984 'Permissible limits of visual defects for insulating porcelains', issued by Japanese Standard Association, Tokyo (JIS).

This standard has been prepared to identify the visual defects in insulating porcelains and thus classifying the basis for rejection of defectives so as to arrive at a common approach between the manufacturer and the user of such products.

For easy understanding of this standard, the visual defects have been indentified and codified in Table 1. These have also been shown in Fig. 1 and Fig. 2.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PERMISSIBLE LIMITS OF VISUAL DEFECTS FOR INSULATING PORCELAINS FOR ELECTRICAL CIRCUITS

1 SCOPE AND FIELD OF APPLICATION

1.1 This standard applies to visual inspection o insulating porcelains to be used on electrical circuits, such as porcelain insulators, porcelain casings for lighting arresters and bushings, porcelain bases for switches and tap-boards and so on.

1.2 This standard substantially prescribes permissible limits of visual defects which are considered to have no influence upon the performance of insulating porcelains.

2 VARITIES OF VISUAL DEFECTS

2.1 The visual defects most incidental to ordinary insulating porcelains are given in Table 1.

2.2 Size of visual defects are expressed by the maximum length *L* irrespective of the forms of defects. The typical examples of *L* are shown in Fig. 1.

2.2.1 While CF shall not be permitted usually (*see* **5.1.3**, **5.2.3** and **5.3.4**) CF whose opening is located at circumferential edge of porcelain shell or shed, and whose plane of flaw is parallel to that of shell or shed, shall be agreed between manufacturer and user.

2.2.2 Inside or outside of tap-yard means respectively inside or outside of the envelope line of tap-holes. Typical example of tap-board is shown in Fig. 2.

Table 1 Most Incidental Visual Defects

(*Clause* 2.1)

Abridged Notation	Distinctive Feature of Defect and its Origin
FD	Foreign granular incombustible substance deposited and stuck on the glazed surface, or sand deposited and stuck on the surface other than to be sanded.
DS	Dark spot on the surface of porcelain caused by diffusion of metallic particle.
DSS	Dark spot produced on the sanded surface of porcelain.
BG	Bald spot or small area left unglazed on the surface to be glazed.
BS	Bald spot or small area left unsanded on the surface to be sanded.
SC	Scar due to miscontact with neighbouring articles fired side by side in the same saggar or slab.
CP	Chip or small injury on the surface of porcelain.
TH	Tinyhole or the surface of porcelain or hemi-spherical cavity left behind gas bubble.
CF	Crack or flaw in the glaze or in the shell, shed, rib, trunk and any other portion of porcelain body.
SS	Scratched streak on the glazed surface of porcelain.
MS	Mat spot of bruise on the glazed surface due to collision with hard substance.
UD	Out of tone due to uniform discolourment of the porcelain surface.
PD	Lack of uniformity due to partial (or local) discolourment of the porcelain surface.
CW	Fine crinkles or crapy wrinkles crimped on the glazed surface caused in firing.
PB	Pimples or blisters in the glaze or in the porcelain body caused by wrong mixing of raw materials or improper drying or firing.
UF	Underfiring of the porcelain body or glaze.
AD	Bad appearance due to ashes deposited on the surface of porcelain.
GT	Excess glaze solidified in a stage of trickling on the surface of porcelain.
FM	Marking of wrong size, tone, location and hard legibility.

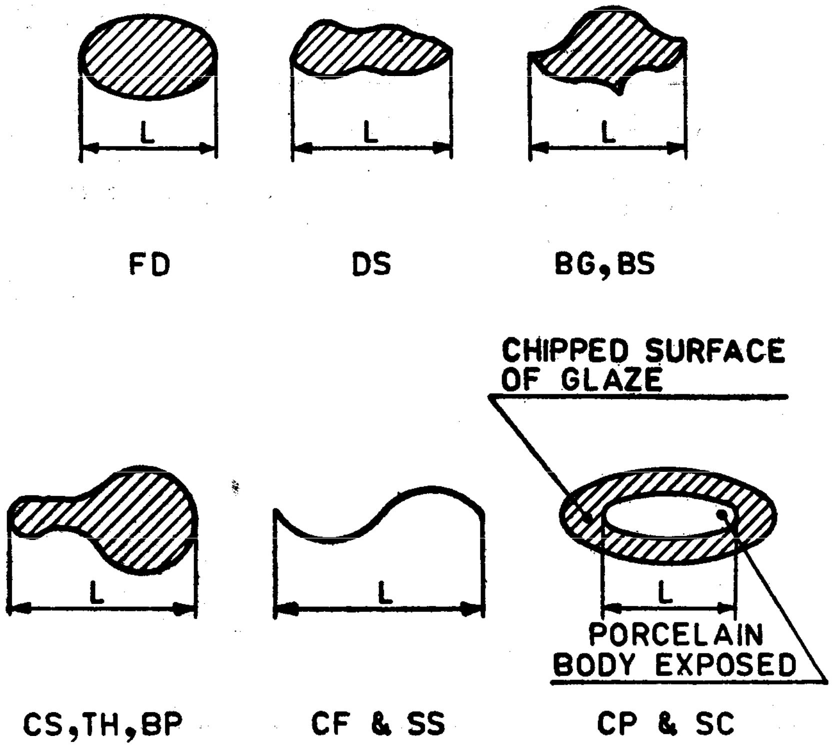

FIG. 1 TYPICAL EXAMPLES OF 'L'

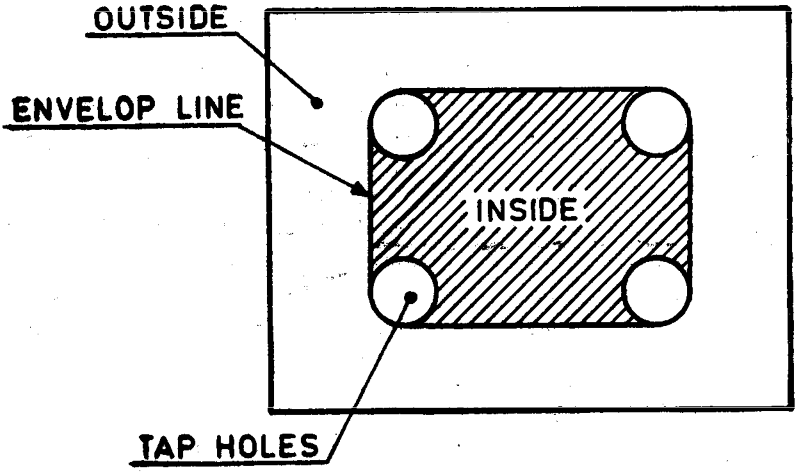

FIG. 2 TAP BOARD

3 CLASSIFICATION OF INSULATING PORCELAINS

3.1 For convenience of application of this standard, all the insulating porcelains to be inspected are classified in Table 2.

4 METHODS OF VISUAL INSPECTION

4.0 General

Visual inspections of insulating porcelains are classified in **4.1** to **4.3** according to the surfaces to be inspected, varying with the types of insulating porcelains.

4.1 Outer Surface Inspection

Whole outer surfaces of all types of insulating porcelains shall be inspected.

4.2 Local Surface Inspection

Defects per projected area of 100 cm^2, at local surface of an A Class insulator where the visual defects are most crowded, shall be inspected.

4.3 Inner Surface Inspection

Inner surfaces of A Class and C Class insulators are inspected in case of necessity.

5 PERMISSIBLE LIMITS OF VISUAL DEFECTS

5.0 General

Permissible limits of visual defects for each class of insulating porcelain shall be in compliance with those prescribed in one of the *following clauses* and, if necessary, with two *subsequent provisions* in **5.1** and **5.2**.

Total number of defects of different kinds coexisting in one porcelain shall not exceed the greatest of the maximum number permitted for respective kind of defect.

For inner surface of A Class and C Class insulating porcelains, the permissible limits of defects shall be twice as large in size, and twice as many in number, as those for outer surface.

Table 2 Classification of Insulating Porcelains

(*Clause* 3.1)

Class	Typical Insulators and Bushings	Class Number	Range of Size From To	Remarks Unit of Size
(1)	(2)	(3)	(4)	(5)
A	Solid or hollow cylinders or cones for line post, station post, long rod insulators and for EHV bushings	A-1	~ 1 499	cm^2 projected area that is, *Max* diameter x height
		A-2	1 500 ~ 4 999	
		A-3	5 000 ~ 9 999	
		A-4	10 000 ~ 19 999	
		A-5	20 000 ~	
B	EHV pin type insulators, suspension insulators, cap and pin type and disk type switch and bus insulators	B-1	~ 169	mm, *Max* diameter
		B-2	170 ~ 209	
		B-3	310 ~ 369	
		B-4	370 ~	
C	EV line insulators	C-1	—	—
	HV apparatus bushings	C-2	—	
	HV wall bushings	C-3	—	—
D	Communication line insulators	D 1	—	—
	LV outdoor insulators	D-2	—	—
	LV indoor insulators bushings	D-3	—	—
E	Porcelain bases for switches and tap-boards, etc.	E-1	~ 100	cm^2 one side surface area
		E-2	200 ~ 399	
		E-3	400 ~	

NOTE — The projected area for Class A shall be the product of the maximum diamater and maximum height.

5.1 Permissible Limits of Visual Defects for A Class

5.1.1 Permissible limits of FD, DS, BG, SC, CP and TH shall be shown in Table 3.

5.1.2 DSS and BS on the sanded surface of an area in total less than 1/10 of the sanded surface shall be permitted unless the maximum diameter of respective defects exceeds 1/4 of the width of sanded band surface.

5.1.3 CF shall not be usually permitted (*see* **2.2.1**).

5.1.4 SS shall not be permitted unless it is obviously distinguished from CF.

5.1.5 MS shall be permitted unless it is accompanied with visible germ of CF.

5.1.6 UD, PD, GT, AD, CW and FM shall be generally permitted unless they appear remarkably bad. UD shall be visually compared with glazed specimens provided beforehand and permissibility shall be agreed between the manufacturer and the user.

5.2 Permissible Limits of Visual Defects for B Class

5.2.1 Permissible limits of FD, DS, BG, SC, CP and TH shall be as shown in Table 4.

5.2.2 DSS and BS on the sanded surface of an area in total less than 1/10 of sanded surface shall be permitted unless the maximum diameter of respective defects exceeds 1/4 of the width of sanded band surface.

5.2.3 CF shall not be usually permitted (*see* **2.2.1.**)

5.2.4 SS shall not be permitted unless it is obviously distinguished from CF.

5.2.5 MS shall be generally permitted unless it is accompanied with visible germ of CF.

5.2.6 UD, PD, GT, AD, CW and FM shall be generally permitted unless they appear remarkably bad. UD shall be visually compared with glazed specimens provided before hand permissibility shall be agreed between the manufacturers and the user.

5.3 Permissible Limits of Defects for C Class

5.3.1 Permissible limits of FD, DS, BG, SC, CP and TH shall be as shown in Table 5.

5.3.2 DSS on the sanded surface of an area in total less than 1/10 of the sanded surface shall be permitted unless the maximum diameter of respective defect exceeds 5 mm.

5.3.3 BS of an area in total less than 1/10 of sanded surface shall be permitted unless the maximum diameter of respective defect exceeds 1/4 of the width of sanded band surface.

5.3.4 CF shall not be usually permitted (*see* **2.2.1**).

Table 3 Permissible Limits of Visual Defects for A Class Insulating Porcelain

(*Clause* 5.1.1)

Class No. (1)	FD, DS and BG			S C		CP		TH	
	Size of Defect mm (2)	Number Outer (3)	Local	Size of Defect mm (4)	Number (5)	Size of Defect mm (6)	Number (7)	Size of Defect mm (8)	Number (9)
A-1	dia 1 ~ 6	6	3	dia 3 ~ 6	1	dia 3 ~ 4	1	dia 1 ~ 2	8
A-2	dia 1 ~ 8	8	3	dia 3 ~ 8	1	dia 3 ~ 6	1	dia 1 ~ 2	10
A-3	dia 1 ~ 10	10	3	dia 3 ~ 10	1	dia 3 ~ 8	2	dia 1 ~ 2	12
A-4	dia 1 ~ 12	12	3	dia 3 ~ 12	1	dia 3 ~ 10	2	dia 1 ~ 2	15
A-5	dia 1 ~ 15	16	3	dia 3 ~ 15	1	dia 3 ~ 12	3	dia 1 ~ 2	18

NOTES

1 FD shall be evenly smoothed and after smoothing its size shall be within the limits prescribed in Table 3.

2 DS with TH at its centre shall not be permitted.

3 One slender BG of a width less than 3 mm, and of an area less than 60 mm^2 shall be permitted within the limits prescribed in Table 3.

4 FD and BG located on the conductor groove of the line post insulator shall not be permitted.

5 SC shall be evenly smoothed and after smoothing its size shall be within the limits prescribed in Table 3.

6 CP shall not be permitted when it is located on any portion where it affects the performance of the insulating porcelain in service adversely. Only one CP longer than 5 mm shall be permitted within the limits prescribed in Table 3.

Table 4 Permissible Limits of Visual Defects for B Class Insulating Porcelains

(*Clause* 5.2.1)

Class Number	FD, DS and BG		SC and CP		TH	
	Size of Defect mm	Number Outer	Size of Defect mm	Number Outer	Size of Defect mm	Number Outer
(1)	(2)	(3)	(4)	(5)	(6)	(7)
B-1	dia 1 ~ 3	4	dia 2 ~ 3	1	dia 1 ~ 2	4
B-2	dia 1 ~ 3	5	dia 2 ~ 3	1	dia 1 ~ 2	5
B-3	dia 1 ~ 4	6	dia 2 ~ 4	2	dia 1 ~ 2	6
B-4	dia 1 ~ 5	7	dia 2 ~ 5	2	dia 1 ~ 2	7

NOTES

1 FD shall be evenly smoothed and after smoothing its size shall be within the limits prescribed in Table 4.

2 DS with TH at its centre shall not be permitted.

3 One slender BG of a width less than 3 mm and of an area less than 30 mm^2 shall be permitted within the limits prescribed in Table 4.

4 FD and BG located on the conductor groove of the pin type insulator shall not be permitted.

5 SC shall be evenly smoothed and after smoothing its size shall be within the limits prescribed in Table 4.

6 CP shall not be permitted when it is located on any portion where it affects the performance of the insulator in service adversely.

5.3.5 SS shall not be permitted unless it is obviously distinguished from CF.

5.3.6 MS shall be generally permitted unless it is accompanied with visible germs of CF.

5.3.7 UD, PD, CT, AD, CW and FM shall be generally permitted unless they appear remarkably bad. UD shall be visually compared with glazed specimens provided beforehand and permissibility shall be agreed between the manufacturers and the user.

5.4 Permissible Limits of Visual Defects for D Class of Insulating Porcelain

5.4.1 Permissible limits of FD, DS, BG, SC, CP, TH, PB and CF shall be as shown in Table 6.

5.4.2 DSS on the sanded surface of an area in total less than 1/10 of sanded surface shall be permitted unless the maximum diameter of respective defect exceeds 5 mm.

5.4.3 BS of an area in total less than 1/10 of sanded surface shall be permitted unless the maximum diameter of respective defect exceeds 1/4 of the width of sanded band surface.

5.4.4 UF shall not be permitted.

5.4.5 UD, PD and AD shall be permitted unless they appear remarkably bad.

5.5 Permissible Limits of Visual Defects for E Class of Insulating Porcelain

5.5.1 Permissible limits of FD, DS, BG and TH shall be as given in Table 7.

5.5.2 No CP located inside the tap-yard (*see* **2.2.1**) shall be permitted, while outside the tap-yard, up to three CP shall be permitted unless their length each exceeds 3 mm.

5.5.3 No CF located inside the tap-yard shall be permitted, while outside the tap-yard of LV insulating porcelains manufactured by means of dry pressing up to three CF shall be permitted unless their length each exceeds 5 mm.

6 VISUAL DEFECTS WHICH ARE NOT DESCRIBED IN THIS STANDARD

6.1 Permissible limits of visual defects which are not described in this standard shall be agreed between the manufacturer and the user, making good use of a prescription for the most nearly allied defects in this standard.

6.2 All visual defects of size smaller than the lower limits prescribed in this standard shall be ignored.

Table 5 Permissible Limits of Visual Defects for C Class

(*Clause* 5.3.1)

Class Number	FD		DS		BG		SC		CP		TH	
	Size of Defect mm	Number	Size of Defect mm	Number	Size of Defect mm	Number	Size of Defect mm	Number	Size of Defect mm	Number	Size of Defect mm	Number
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
C-1	dia 1 ~ 4	6	dia 1 ~ 3	6	dia 1 ~ 3	3	dia 1 ~ 4	1	dia 1 ~ 3	2	dia 1 ~ 2	4
C-2	dia 1 ~ 4	4	dia 1 ~ 3	4	dia 1 ~ 2	2	dia 1 ~ 3	1	dia 1 ~ 2	2	dia 1 ~ 2	3
C-2	dia 1 ~ 4	6	dia 1 ~ 3	6	dia 1 ~ 3	3	dia 1 ~ 4	1	dia 1 ~ 3	2	dia 1 ~ 2	4

NOTES

1 FD shall be evenly smoothed and after smoothing its size shall be within the limits prescribed in Table 5.

2 DS with TH at its centre shall not be permitted. DS located on the conductor groove of C-1 shall be permitted.

3 One slender BG of a width less than 1 mm and of an area less than 5 mm^2 shall be permitted within the limits prescribed in Table 5.

4 SC shall be evenly smoothed and after smoothing its size shall be within the limits prescribed in Table 5.

5 CP located on the conductor groove of C-1 shall not be permitted.

Table 6 Permissible Limits of Visual Defects for D Class of Insulating Porcelain

(*Clause* 5.4.1)

Surface to be Inspected	FD and DS		BG		SC		CP		TH and PB		CF	
	size of Defect mm	Number	Size of Defect mm	Number	Size of Defect mm	Number	Size of Defect mm	Number	Size of Defect mm	Number	Size of Defect mm	Number
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Whole Surface	dia 0·5~ 1	10										
Conspicious area	dia 1 ~ 3	2	dia 1 ~ 3	3	dia 1 ~ 4	1	dia 1 ~ 5	3	dia 1 ~ 3	2	dia 2 ~ 5	1
Inconspicious area	dia 1 ~ 5	3							dia 1 ~ 5	3	dia 2 ~ 5	3

NOTES

1 FD shall evenly smoothed and after smoothing its size shall be within the limits prescribed above. FD located on the conductor groove shall not be permitted.

2 One slender BG of a width less than 1 mm and of an area less than 5 mm^2 shall be permitted within the limits prescribed in Table 6. BG located on the conductor groove shall not be permitted.

3 SC shall be evenly smoothed and after smoothing its size shall be within the limits prescribed in Table 6.

4 No more than one CP longer than 3 mm shall be permitted within the limits prescribed in Table 6.

5 CF shall not be permitted unless it is covered with a continuous layer of glaze.

CF shall not be permitted when they are located on the conductor groove and other portion where they affect the performance in service adversely.

Table 7 Permissible Limits of Visual Defects for E Class

(*Clause* 5.5.1)

Class Number	FD				DS				BG				TH	
	Inside*		**Outside***		**Inside**		**Outside**		**Inside**		**Outside**		**Inside**	
	Size of Defect mm	Number	Size of Defect mm	Number	Size of Defect mm	Number	Size of Defect mm	Number	Size of Defect mm	Number	Size of Defect mm	Number	Size of Defect mm	Number
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
E-1	dia 1 ~ 1	3	dia 1 ~ 3	3	dia 0·5 ~ 2	3	dia 1 ~ 3	3	dia 1 ~ 2	3	dia 1 ~ 3	3	dia 0·5 ~ 2	3
E-2	dia 1 ~ 2	4	dia 1 ~ 3	5	dia 0·5 ~ 2	4	dia 1 ~ 3	5	dia 1 ~ 2	4	dia 1 ~ 3	4	dia 0·5 ~ 2	4
E-3	dia 1 ~ 2	5	dia 1 ~ 3	7	dia 0·5 ~ 2	5	dia 1 ~ 3	7	dia 1 ~ 2	5	dia 1 ~ 3	5	dia 0·5 ~ 2	5

NOTES

1 FD shall be evenly smoothed and after smoothing its size shall be wlthin the limits prescribed above.

2 DS with TH at its centre shall not be permitted.

*(*See* **2.2.1**).

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